

Factors Affecting the Sustainable Development of Community-Managed Nurseries for Promoting Rare Conifer Species in North-West Vietnam

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Abstract This study examines factors affecting the sustainable development of seven community-managed nurseries growing two rare and valuable indigenous conifer species—*Fokienia hodginsii* and *Taiwania cryptomerioides*—in the Hoang Lien Mountain range in North-West Vietnam. The nurseries were pilot programs of the Fauna and Flora International (FFI) project entitled *Community Based Conservation of the Hoang Lien Mountain Ecosystem*. FFI partnered with local government organisations and farmers to carry out the pilot program, with the objective of providing improvements in community livelihoods together with measurable conservation benefits. This study, completed in September 2006, revealed that the overall objectives of the pilot program were not achieved due to financial, management, and technical reasons. There was a lack of market demand for these two rare conifer seedlings. Farmers and State Forestry Enterprises (SFEs) prefer to invest in fast-growing species for an earlier return. Demand for the seedlings by National Parks (NPs) is nearly zero due to limited funds to purchase seedlings and the capacity of NP staff to produce seedlings of these two rare conifer species. These two species are not included in the approved list of species by the Ministry of Agriculture and Rural Development (MARD) for the 5 Million Hectare Program (5MHP). The seed germination rate in nurseries was typically low, nursery

This paper is the summarisation of the consultant report by the two authors, titled *A Review of Community Managed Nurseries for Two Rare Conifer Species, Fokienia hodginsii and Taiwania cryptomerioides in North-West Vietnam*.

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operators were not well trained by FFI technical staff, and most of them did not understand fully all stages to set up and operate nurseries. Also, the co-operation among partners in the pilot program was not effective due to local partners not fully understanding their responsibilities, hence farmers did not receive valuable advice when they met technical difficulties. The research suggests that future similar projects can be more effective if major planting programs include these two rare conifer species in the approved list. Farmers operating community-managed nurseries should have adequate training and technical support by SFEs and NPs. Community-managed nurseries require sales contracts for seedlings of rare species with local customers (SFEs, district SMHP management board and NPs). International organisations can play a role in providing funds to start up projects and oversee the responsibility of each of the partners involved in these projects.

Keywords Hoang Lien Son Mountains · 5 Million Hectare Program · Community-based conservation · Community-managed nurseries · *Fokienia hodginsii* · *Taiwania cryptomerioides*

Introduction

Fauna and Flora International (FFI), Vietnam program, established seven community-managed nurseries for two rare and valuable species of indigenous conifers, *Fokienia hodginsii* (Po Mu) and *Taiwania cryptomerioides* (Bach Tan Dai Loan), in the Hoang Lien Mountains of Lao Cai and Yen Bai provinces in North-West Vietnam. The nurseries were established from December 2004 to March 2006 as part of the project entitled *Community-Based Conservation of the Hoang Lien Mountain Ecosystem*. This project was a partnership between FFI and the Forest Protection Departments (FPDs) and Forest Protection Stations in the provinces of Lao Cai, Yen Bai, and Son La. The project was designed to assist local communities in maintaining the biological diversity and landscape conservation in the Hoang Lien Mountain forest and improve the livelihoods of people living in the area.

Fokienia hodginsii is a globally near-threatened species of cypress heavily exploited throughout its mountainous Indo-Chinese range. This species occurs naturally in forest with an elevation of above 800 m. In the Hoang Lien Mountains of Vietnam, this species is harvested at unsustainable rates to supply a lucrative domestic furniture trade. The timber is favoured for house construction by the ethnic communities living in these mountains. Local people are also employed in extraction of the timber for commercial markets as one of the few cash income-generating opportunities available to them.

Taiwania cryptomerioides is another species of cypress globally vulnerable to extinction within Vietnam, where only one remnant population of about 150 trees is known to survive within the Hoang Lien range at 1,750–2,100 m elevation. Locally, in nearby villages, *Taiwania* timber has been used for house construction. It was discovered in Vietnam in the last 5 years, and as yet no commercial trade exists for this species. However, *Taiwania* is a major component of commercial state forestry

in Taiwan and southern China. There could be great potential for cultivation of *Taiwania* in Vietnam.

The conservation benefits anticipated from nurseries for these species are:

- (a) a source of seedlings for government reforestation programs;
- (b) reduced pressure on natural populations of propagated species through provision of alternative, cultivated timber; and
- (c) ex situ conservation of the genetic resource.

Livelihoods of participating households were also expected to improve through:

- (a) financial asset development through the sale of seedlings to government reforestation programs, and perhaps also commercial plantations;
- (b) natural asset development through the supply of valuable timber tree seedlings for subsistence use by future generations;
- (c) human asset development through technical training in key competencies for running and managing the nurseries; and
- (d) physical asset development through construction of nursery infrastructure and purchase of equipment.

This paper discusses the results of the assessment of the economic and subsistence viability, and the institutional arrangements necessary to achieve community-managed conifer nurseries that make significant contributions to both conservation and sustainable rural livelihoods. A particular objective of the review was to address the institutional and economic aspects of nursery development and future operation.

Research Method

During July and August 2006, the authors visited seven nurseries and interviewed people involved in the pilot project. One week was spent in Hanoi interviewing FFI project staff involved in the nurseries, and in particular the technical officer who had principal responsibility for the nurseries.

Assistance was provided by FFI staff during the field trip. In Lao Cai, the provincial coordinator accompanied the team on visits to Seo Mi Ty village, Ta Van commune, Sa Pa district and Bo Hai village in Khanh Yen Ha commune, and to Dong Qua village, Liem Phu commune in Van Ban district. In Yen Bai, the authors were accompanied by a conservation biologist of FFI and a representative of the FPD, Mu Cang Chai district. In August 2006, the FPD staff member was seconded part-time to the project. Before June 2006, he was the member most involved with the nurseries and liaised with the technical staff of FFI. He was also of Hmong ethnic group and acted as translator and guide for visits to the more remote villages in Che Tao and Nam Co communes.

In the field trip, two groups of interviews were conducted. The first was specific to the nursery establishment, organisation and management, and technical issues of growing the seedlings. This group consisted of FFI staff, household-operated nurseries, village and commune officers, and FPD officers. The second group was a

market survey of the potential for selling the seedlings and ascertaining a price. This group involved District Economic Departments, district 5 Million Hectare Reforestation Program (5MHP) management boards, province 5MHP management boards, the central 5MHP management board at Ministry of Agriculture and Rural Development (MARD), Provincial Forest Development Departments, the State Forestry Enterprises (SFEs), and Hoang Lien Son National Park.

Key Elements of the Nursery Model for this Pilot Project

The pilot nursery model established by FFI has four fundamental elements:

Intervention at the household level. The establishment of nurseries was largely a project between FFI staff and households. Other parties included leaders and selected staff of FPD, NP, and Communes. Memoranda of Understanding (MOUs) were signed by the heads of FFI, FPD, the Commune Peoples Committee, and the head of the household which operates the nursery. In Seo Mi Ty village, the NP was a signatory rather than the FPD because the nursery lands are in NP. The commune administration officers were involved in initial selection of households but nursery establishment, technical training, and financial support has occurred directly with the households.

Provision of technical training to households. All technical advice and support such as a technical training document was provided by the FFI staff member. No other outside or local expertise was employed in nursery establishment and techniques for growing these two species.

Provision of funding for nursery establishment and growing seedlings. The project paid for seed, pots, fertiliser, and labour for the preparation of the nursery site (clearing the area for beds and building a perimeter fence), putting soil in pots, watering and tending the seedlings until ready to plant out.

Reliance on the market for seedlings. The project did not buy the seedlings from the nurseries. The FFI support was only to help the households start their nurseries with an expectation of customers being prepared to purchase seedlings. In the MOUs, there was also reference to the seedlings being planted by the community if they could not be sold. The commune was responsible for ensuring equitable seedling distribution in the community and actual planting for the purpose intended.

The Nursery Sites and Status of Seedlings

Nursery sites were selected with advice from the commune administration based on the criteria of:

- low-income village in the commune;
- village that has a willingness to develop a nursery for new species;
- the village and household has strong community thinking;
- the households have strong influence with local people, and are suitable role models;

- households have basic understanding of forest development and a capacity to understand the technical aspects of nursery operation;
- household labour is mostly ethnic minority women; and
- the household has a suitable area to establish a nursery (150 m², at a reasonable elevation).

In addition, in Khanh Yen Ha and Liem Phu communes, villages were selected that had been active in a SFE. In general, all nurseries are located on household land except for Che Tao nursery, where commune land was used.

Characteristics of the Nursery Sites

Seven nurseries were established (Table 1). The nursery in Seo Mi Ty village was divided into two small nurseries managed by two households. There is not any clear information to explain why FFI staff, commune leaders, and household leaders agree to divide the official nursery accepted by FFI at the beginning into two smaller nurseries.

The first two nurseries for *F. hodginsii* and *T. cryptomerioides* were established in December 2004. These nurseries are located in Lung Cung and Phin Ngai villages in Yen Bai Province. The villages are located at an elevation of 1,600 m, surrounded by mountains over 2,000 m high. In August 2006, these two nurseries had a total of 12,000 healthy seedlings ready to out-plant. It is clear the two nurseries have been well supported by FFI staff. Some of the *Taiwania* trees had already been planted in the village in July 2005.

The third nursery site, established in July 2005 for *F. hodginsii*, is in Seo Mi Ty village, within the Hoang Lien Son National Park. The village is at an elevation of about 1,500 m, dominated by Hmong ethnic people and is located approximately 2 h from Sa Pa town by motorbike. Two small nurseries were established at this site. Seedlings from these nurseries were taken from first and second nurseries in Nam Co commune. One thousand small seedlings (3–5 cm) for each nursery were brought from the first and second nurseries in Nam Co commune to plant pots in the two nurseries in Seo Mi Ty village. As of August 2006 only a few of the seedlings produced in these nurseries were healthy.

The remaining four nurseries were established in March 2006. Two of these are in Van Ban District, Lao Cai province, and the rest are in Mu Cang Chai District, Yen Bai province. These nurseries were producing purely *F. hodginsii*. The nurseries in Van Ban district are close together, about 20 min drive apart. In Yen Bai, the new nurseries in Che Tao Commune are about 75 km from the nurseries in Nam Co commune. These two districts have some of the largest areas of remaining *Fokeinia* forest in the Hoang Lien range.

In Van Ban district, one nursery is located in Bo Hai Village, at an elevation of only 150 m. The nursery did not have a high germination success, and the landowner reused many of the pots of failed seedlings to grow *Acacia* sp. to sell to a local enterprise. The second nursery in Van Ban district was located in Dong Qua Village of Liem Phu at a low elevation (220 m). Even though germination rate has been low, this nursery is well established and is more successful than Bo Hai nursery.

Table 1 Nursery location and production statistics

No.	Village and commune	District and province	Date established	Species grown	Target production (number)	Current production (number)	Average seedling size	Germination rate (%)	Est. distance to district centre (km)	Transportation means		
										Bus (km)	Motorcycle (km)	Foot (km)
1	Lung Cung/ Nam Co	Mu Cang Chai/ Yen Bai	Dec 04	<i>F. hodginsii</i>	6,000	6,000	50–60 cm	100.00	30	10		20
				<i>T. cryptomerioides</i>	3,000	50 (300 planted)	25 cm	11.67	30	10		20
									30	10		20
2	Phin Ngai/ Nam Co	Mu Cang Chai/ Yen Bai	Dec 04	<i>F. hodginsii</i>	6,000	6,000	50–60 cm	100.00	30	10		20
				<i>T. cryptomerioides</i>	3,000	500 (100 planted)	30 cm	20.00	30	10		20
									30	10		20
3	Seo Mi Ty/ Ta Van	Sapa/Lao Cai	July 05	<i>F. hodginsii</i>	1,000	200	5–10 cm, low quality	20.00	15	10		5
				<i>F. hodginsii</i>	1,000	350	5–25 cm	35.00	15	10		5
4	Bo Hai/Khanh Yen Ha	Van Ban/ Lao Cai	Mar 06	<i>F. hodginsii</i>	15,000	1,500	5 cm	10.00	10	10		
5	Dong Qua/ Liem Phu	Van Ban/ Lao Cai	Mar 06	<i>F. hodginsii</i>	15,000	4,000	5–10 cm	26.67	10	10		
6	Che Tao/ Che Tao	Mu Cang Chai/ Yen Bai	Mar 06	<i>F. hodginsii</i>	4,000	200	5 cm	5.00	35	15		20
7	Ta Dong/ Che Tao	Mu Cang Chai/ Yen Bai	Mar 06	<i>F. hodginsii</i>	4,000	300	5 cm	7.50	35	15		20

In Mu Cang Chai district, in addition to the older Nam Co Commune nurseries, two nurseries were located in Ta Dong and Che Tao villages of Che Tao Commune. Access to this commune is relatively difficult, the commune centre being 35 km from the Mu Cang Chai district centre. The road is in poor condition, only accessible by motorbike during dry conditions. From the commune centre, Che Tao village nursery is 20 min walk. Ta Dong village is 2 h walk from the Commune Centre.

Che Tao village nursery is managed by two families. One representative is the deputy leader of the commune, and the only representative of this nursery who speaks Kinh language—the official and popular language in Vietnam. The nursery is sited on commune-managed land within a few 100 m of the households that tend the nursery. Only a few hundred seedlings now survive at this nursery.

Ta Dong village nursery is located about 40 min walk from the village centre amongst corn crops of the household tending this nursery. The nursery—located far from the household home—is well tended, but the germination rate has been low.

The Market Study for the Seven Nurseries

The intent of the nursery project was to evaluate the potential for sustainable businesses for the seedlings of the seven nurseries. Critical to this is a continuing market and sufficiently high seedling price. At the commencement of the nursery project, it was assumed that there would be a demand for these seedlings (*F. hodginsii* and *T. cryptomerioides*), particularly *F. hodginsii* because it is extensively used for furniture production and is widely known as a high-value species. However, with seedlings in two nurseries ready to plant, no ready market was apparent. Information was collected on potential customers of these species, competitors for seedling production and, if a market existed, the price of seedlings.

Potential Customers for Seedlings

Potential buyers for seedlings of the two species are the local SFEs, the District 5MHP Management Boards, and the Hoang Lien Son National Park. SFEs require seedlings of timber trees for commercial plantings. District 5MHP management boards use seedlings to plant in the area designated in 5MHP. Hoang Lien Son National Park is responsible for conservation plantings. However, the demand of seedlings from these potential customers is low. The 5MHP board in Sa Pa district did not include *F. hodginsii* to be planted under this program because *F. hodginsii* seedlings are slow growing and too expensive.

The focus of the 5MHP management board in Van Ban district is on the establishment of production forest. Species selected include acacias, *Mangletia conifera*, *Canarium album*, *Cinnamomum cassia*, and *Schima* spp. *Fokienia hodginsii* is not recommended. This species is also not included in the 5MHP in Mu Cang Chai district. Species selected include *Pinus massoniana*, *Malus doumeri*, tea, and *Cunninghamii lanceolata*.

The SFE in Van Ban district has a clear mandate to make a profit and is focussing on short-rotation species. It has no interest in planting *F. hodginsii*, even though it manages land suitable for growing these species. It is responsible for 19,000 ha of land in Van Ban, much of this is above 1,000 m. Its focus is on species for paper production, predominantly bamboo and *Acacia* sp.

In Sa Pa district, the Hoang Lien Son National Park is a potential customer for *F. hodginsii* seedlings. Most of the land within the NP is suitable for growing these species, and the park has substantial areas of low quality regeneration forest that would benefit from enrichment planting. The NP appears to be relatively well funded, based on the facilities at their offices. Despite this, the park has limited funds for planting *F. hodginsii*, which is considered by the park management as an expensive species to grow, and requires a specific funding program. They have applied for funding for *F. hodginsii* enrichment planting of 500 ha with a total of 10,000 trees.

At a central level, in the 5MHP management board of MARD in Hanoi there is little support to plant *F. hodginsii*. Although a high value species, it is not included in the list of approved or highly recommended species for production forest (MARD 2005a). It is included in the list for protection species in Yen Bai province only, not Lao Cai (MARD 2005b). However, the 5MHP officer in MARD stated that district 5MHP management boards can plant other species (Pham 2006). They must provide a plan, to be approved at the province level. The province level plan requires endorsement by MARD and for a species such as *F. hodginsii*, approval would be likely if planned for establishment on a site of high ecological value.

Competition from Seedlings Produced by Community-Managed Nurseries

In some districts, land management organisations including SFEs and NP also have their own nurseries and are a potential competitor to the establishment of community nurseries. The SFE/5MHP management board in Mu Cang Chai district has seven nurseries located throughout the district, including one in Che Tao commune, and one in Nam Co where the pilot nurseries are located. The SFE/district 5MHP management board has high technical skills for forestry activities including seedling production. The capacity of each of the two nurseries visited is between 350,000 and 450,000 seedlings per year.

The Hoang Lien Son National Park has its own nursery and tissue culture laboratory managed by highly skilled staff. In anticipation of receiving some *F. hodginsii* funding in the future, in 2006 the staff trialed the establishment of seedlings from seed and also from cuttings taken from trees near Sa Pa town. They produced 4,000 healthy seedlings which were 5 cm in height, in August 2006. Cuttings successfully produced roots. If they receive funding for planting *F. hodginsii*, they have the capacity to produce their own seedlings.

The nurseries of the SFE, 5MHP management boards, and Hoang Lien Son National Park are potential competitors to community nurseries. The NP and SFE/5MHP nurseries are relatively large, with highly skilled staff and suitable infrastructure. However, two factors may allow community-based nurseries located in villages to be competitive:

1. The household labour cost in rural areas of Vietnam is nearly zero, much less than that of paid labourers in company nurseries.
2. Particularly for more remote and difficult-to-access planting areas, growing seedlings close to the site rather than transporting them from a larger central nursery may be cost-effective, which may constitute a real competitive advantage for village-based nurseries.

Selling Price of *Fokienia* Seedlings

It was difficult to ascertain an appropriate price for *F. hodginsii* seedlings, because no recent sales could be identified in the survey. Provinces approve price lists each year for species involved in their 5MHP, but *F. hodginsii* is not part of their plans and is not listed. Prices are currently 200–500 VND per seedling for fast-growing species such as *Pinus massoniana* (\$US 1 = 15,500 VND, in 2006). The NP estimates production costs of *F. hodginsii* at 2,000 VND per seedling grown to 18 months of age. The North-West Forestry Science Production Centre in Son La province has produced *F. hodginsii* seedlings in the past for a Japanese-funded project in Co Ma commune, Thuan Chau district, in Son La province. These were costed to the project at 1,000 VND (for small seedlings <20 cm), up to 5,000 VND (for seedlings more than 30 cm in height with a root collar >0.7 cm). An appropriate price for *F. hodginsii* is probably 3,000 VND per seedling, at 18 months of age, at least 30 cm high and with root collar diameter of at least 0.5 cm.

Assessing the Contribution of Community Nurseries to Community Livelihood Improvement

Livelihood of households participating in *F. hodginsii* and *T. cryptomerioides* seedling production are expected to improve in various ways:

Financial asset development through sale of seedlings to government reforestation program (and commercial plantations). Because no current market exists for the seedlings, sustainable financial asset development will not occur at present. The households directly involved in the nurseries have benefited from the payments made by FFI in the project, but these payments are limited to nurseries establishment and growing to the end of the first nursery cycle.

Natural asset development through supply of valuable timber tree seedlings for subsistence use by future generations. This objective has been achieved to a limited degree by the pilot program; although the number of seedlings established is small, this may still assist future generations. A small annual planting program could satisfy the number of trees required per year for subsistence use. Such a program would not be based around a sustainable business, but more on the willingness and forward thinking of the households currently using seedlings.

Human asset development through technical training in key competencies for running and managing the nurseries. Human resource development has been limited to a few individuals, mainly one representative for each nursery, and the

technical training has not been comprehensive. Only in Bo Hai and Dong Qua villages could training of other than the principal household be confirmed. Other families in these two villages involved in the potting and establishment also received general training on nurseries. However, despite the incomplete training the skills acquired have certainly been appreciated by the individuals involved. All the households were grateful for the opportunity to be involved and most commune leaders noted this as the most positive outcome of the pilot project. In Bo Hai and Dong Qua villages, the skills acquired have assisted the two households to now grow other species, including acacias.

Physical asset development through development of nursery infrastructure and equipment. The community nurseries are in general small, built out of locally available low-cost materials with a basic framework for shading. The fences to protect the area from livestock, and irrigation pipe which was used are the most useful physical assets. Only in the case of Khanh Yen Ha and Liem Phu communes has the asset development been significant for the households. Both these households have utilised the infrastructure built under this project to grow *Acacia* sp. seedlings for local sale. The assets in Seo Mi Ty are poorly built, temporary and of no value. In Phin Ngai village, the household wishes to continue operating the nursery, even without external funding, for the family forest and possibly also for the community.

Assessing the Contribution of the Community Nurseries to Conservation

Three conservation benefits were anticipated from the establishment of communal nurseries:

A source of seedlings for government reforestation programs. In the absence of support from government programs for species such as *F. hodginsii* there is no potential to meet this objective.

Reduced harvest pressure on high value and rare timber tree species from natural forest through provision of alternative, cultivated timber. This objective will not be achieved through the pilot nurseries and the potential to achieve this from community-managed nurseries is low. For *F. hodginsii*, due to the small total number of seedlings produced, and the lack of sustainability of these nurseries, the contribution to providing cultivated timber is limited. In total there are enough seedlings for enrichment planting of less than 50 ha at 300 trees per hectare. For a measurable positive conservation outcome, the nurseries would need to be operating for many years. It seems unlikely that future nurseries will have an impact on natural populations of these slow-growing species; they will not be an alternative source of timber for many decades. For *Taiwania*, the resource is already exhausted. For *F. hodginsii*, there is evidently a large amount illegal harvesting still occurring in the region of the nurseries. While walking in and out of Lung Cung and Phin Ngai villages, where most of the seedlings are produced, it was observed that a large amount of *F. hodginsii* was being transported along the track, and hunters and wood collectors were seen. If the current management practices for *F. hodginsii* were continued, the resource would be exhausted before the seedlings from these

nurseries can provide an alternative wood source. Within this timeframe, it is highly likely that land ownership, management practices, and protection mechanisms will have changed to improve the conservation of these species. The reduction in pressure on natural populations will occur independently of the cultivated timber eventually produced from these nurseries, either through exhausted supplies or improved management.

Ex situ conservation of genetic resource. A few small plantings of *F. hodginsii* have occurred in other areas in Vietnam. At a minimal level, the genetic resources are likely preserved already. For significant conservation of the genetic resource, a wider planting program—such as at the sites recommended in Nghia (2000a)—or a large reforestation program is required. Without the funding for such a program, further conservation of genetic resources will not be realised. For *T. cryptomerioides*, given the small number of remaining trees in the wild, the establishment of this nursery and small plantings so far have been a favourable conservation result. In July 2005, approximately 300 trees were planted in Lung Cung and Phin Ngai villages as part of a community planting festival. Each household was provided with one to three trees to plant in their household forest, typically regeneration forest. With this planting, and the remaining seedlings, the total number of *T. cryptomerioides* trees in Vietnam will have increased substantially. In August 2006, there are about 12,000 healthy seedlings in Lung Cung and Phin Ngai villages ready to out-plant. While this alone is a positive conservation outcome for these species, the conservation of genetic resources could be secured better by further *ex situ* plantings. Currently the plantings are restricted to the village closest to the remaining stand of *Taiwania*. Establishment of plantings distant from these villages would assist with protection from localised disease or wildfire. An area of secure land tenure and high mountains would be appropriate; suitable areas exist within the current Hoang Lien Son National Park.

Factors Affecting the Success of Community-Managed Nurseries

There are various reasons why the pilot project did not meet the objectives. This section presents some explanations, and provides suggestions on how to make similar future projects more successful.

Technical Support for Community Nurseries

In general the technical support to the nursery operators was not adequate. For Lung Cung and Phin Ngai, the technical support was reasonable, and a concerted effort was put into these two nurseries by FFI staff. However, the remaining nurseries lacked the technical input to assist the households in successfully establishing their nurseries. For these communities, frequent visits or feedback is necessary. The steps involved in growing seedlings are not difficult, but timing is important, and small errors—such as under- or over-watering, even for 1 or 2 days, or damage by frost in the mountains—can greatly impede success. The visits by FFI technical staff were

too infrequent, and between visits there was not an effective mechanism for households to obtain advice about problems. While a FPD staff member was employed part-time to assist households to solve technical problems, it appears the FPD understood this role to be rather narrow, restricted to information collection to pass on to FFI staff.

There are inadequacies in the method used to transfer technical information to the households. Only one person, the household representative in Phin Ngai village, understands how to collect seeds from *F. hodginsii* and *T. cryptomerioides*, and in no village was the treatment of the seed prior to sowing taught to the households. Earlier FFI documents included information on establishment of *F. hodginsii* based on research by the Non Timber Forest Products Research Centre (Osborn 2004, Annex 1, pp. 18–21). MARD also has published a document on how to grow *F. hodginsii* (MARD 1997), and further information is provided in Nghia (2000b). However, it appears none of these documents have been well considered in the nurseries, except those in Lung Cung and Phin Ngai villages. Specifically, the *F. hodginsii* germination rate is known to be low. Despite this, seed has been placed directly into each pot already filled with soil. Much labour went into putting soil in pots, even though 50% failure could be expected. A normal process would be to sow the seeds in an open bed, and ‘prick-out’ germinates at 1–2 cm height to transplant into pots.

In Lung Cung and Phin Ngai villages, some attention was paid likely to germination success. The farmers stated that in each pot they placed two to three seeds. An open bed was also sown with seed, with seedlings transferred to unsuccessful pots.

The selection of pot size has not been ideal. Small plastic pots suitable for fast-growing species have been used. These pots are suitable for pine or acacia which are planted 6–8 months after sowing and at a height of 30 cm. However, *F. hodginsii* stays in the nursery for 18 months before out-planting. Larger pots result in a healthier root system and sturdy seedling Plantable seedlings in Lung Cung and Phin Ngai villages are mostly pot bound.

A further peculiar approach has been the establishment of the nursery in Seo Mi Ty village, Sa Pa district. For this nursery, small germinates were collected from Lung Cung and Phin Ngai nurseries and taken to Seo Mi Ty nurseries and put into small pots. As a result, the local households in Seo Mi Ty have not learnt the process of collecting seed, seed treatment, and sowing. Further, transport from Lung Cung and Phin Ngai villages involves a 1-day walk to the nearest road, from which it is at least a 1-day drive to Sa Pa, and then a further day, partly by motorbike or foot, to Seo Mi Ty. At best, small fragile seedlings are being transported from cool mountains to dry lowlands and back to mountains over 3 days prior to planting. It is noted that 4,000 germinates were taken from Lung Cung and Phin Ngai nurseries, but only 2,000 were planted in Seo Mi Ty nurseries, due to transport losses.

In all cases the seed treatment was done by FFI staff prior to bringing the seed to the nursery site. The seed treatment for *F. hodginsii* is not complex, involving soaking in warm water. A small amount of chemical (KMnO₄, 0.05%) is often used, but could have been omitted. Nghia (2000b) described a seed treatment process without chemical use, and this has also been used successfully at the North-West Forestry Science Production Centre. Ideally, seed is sown immediately after seed

treatment. However, this was not possible given the long transport distances involved. It is also apparent that some households were not aware of the time the FFI staff was arriving with the treated seed, and were not prepared to sow the seed in to pots immediately. In Ta Dong there was a 10-day delay between the household receiving treated seed and sowing. In Che Tao nursery, there was a 6-day delay. The number of days between treatment and delivery by FFI are not known. It is likely that some of the viable seed became unviable during the delays, and contributed to the low success rates of many of the nurseries.

A technical document for households was produced by the project. It is likely this was written after the establishment of the Nam Co nurseries. This document was only partially utilised by households. Not all nursery representatives had sufficient understanding of the Kinh language or sufficient technical understanding of nurseries to read and fully understand the document. In general, the manual is too complex for the education level of the households involved, and for many, who are illiterate, of no value. This was particularly evident in Che Tao and Nam Co Communes. Most of the households also cannot read Hmong, particularly for technical detail, so translation into Hmong would not have assisted the uptake of knowledge. These are difficult communities in which to work, due to the very low education levels of the farmers and illiteracy. Regular and easy contact direct with the farmer is the only way to ensure success in transfer of knowledge. Basic information using many diagrams such as extension brochures could also be helpful.

The majority of the technical information described here relates to *Fokienia*. From the project, the review team was not able to find any documentation for *Taiwania* germination. It is not known how the seeds were treated, or the germination success achieved. The seed was collected locally from trees in Phin Ngai village by the FFI technical staff member and the nursery representative for Phin Ngai village.

Collaborative Actions to Set Up Community Nurseries

These seven nurseries have been established independent of the existing forestry institutions in the communes and districts. A better result could possibly have been achieved by involving organisations such as the local SFEs, 5MHP management board or, in Sa Pa District, the Hoang Lien Son National Park. While the intent of the Hoang Lien Project in trying to focus on the communities rather than the government bureaucracies in these communities is understandable, the capacity of the communities is very low, and the government agencies are important structures to support the communities. These institutions provide strong direction and employment for the local people, and are generally respected. For example, in Mu Cang Chai district there is a highly active 5MHP with seven nurseries which plant more than 1,000 ha per year and employ local people to do this work. The SFE provides the technical advice and is acknowledged by the commune and the FPD as having the best forestry technical skills in the district.

For the FFI to work independently of these institutions, a substantial level of direct contact between FFI staff and the households is required. Particularly with the

access difficulties to some of the villages chosen for the nurseries, it has not been feasible for FFI staff to visit each area frequently enough, and be sufficiently available to respond to queries from the households. By contrast, district 5MHP management boards are working in these areas much more actively, and have continuing contact with the communities. Utilisation of these technical staff by working with the households responsible for the nurseries and being an easier local point of contact would see more problems addressed in a timelier manner and also provide a contact person within the local area beyond the life of the project. Equally, the NP in Sa Pa district has highly skilled nursery staff who were not utilised in the establishment of the Seo Mi Ty nursery. Although much of the nursery and tissue culture focus of the NP is for profit-making activities outside of the core business of the NP, the fact remains that staff are highly skilled in forestry and nursery establishment, and facilitation of a closer relationship between NP and the community would be beneficial.

Appreciation of Project Management Responsibilities

The MOUs were the key documents setting out the responsibilities of each party. However, all interviews indicated that this document was not considered important or understood by the parties who were signatory to it. The commune leader and Head of FPD would sign the Memorandum, but then have no further involvement in the nursery. It is possible the content was not fully passed on to the households involved.

With infrequent visits by FFI staff, and disregard of the memorandum, information regarding who owns the seedlings, and what should happen to them and the commune's responsibilities were not known. The households involved in these nurseries are not familiar with contracts or MOUs. However, communicated properly and regularly, these devices can still be a useful tool to describe responsibilities and add a level of formality to the project.

Timeframe for Establishing Nurseries and Developing Technical Skills

The pilot nursery programs were planned for a short timeframe. The plans and MOUs were designed around the involvement and support of FFI to last for approximately 18 months, until the first batch of seedlings were out-planted. After this, it is implied that the households would have acquired the skills necessary to continue the businesses. However, one cycle is a relatively short period to become a competent nursery manager. It is a major challenge to build a community business in a community not involved in the cash economy, with low education and low capacity to understand some basic but important technical aspects of growing trees. These communities need continuing support to master technical aspects of seedling production, with training for two or three production cycles or at least 3 years.

Individual Family versus Community Management

Each nursery is managed by one family. There is no ownership by the community, only ownership by the households responsible for looking after the seedlings. While

some families were involved in the establishment of the nursery, they were paid for their labour, and their involvement was seen as simply an opportunity to gain income. In most nurseries only the main household received training. In Bo Hai and Dong Qua villages, the involvement of other families was more successful. Many of the families including women who assisted in filling the pots with soil and building the nursery received training as well. However, after this initial establishment work, they have not been involved. In many of the villages, the commune leaders and village leaders were not involved or not particularly enthusiastic. Apart from employment in the planting of trees, the review team could not identify how the broader community was involved in the nursery operations.

Difficulties with Community Attitudes and Role of Project Partners

In the time the review team spent in the communities, little indication was found of a genuine and broad concern for conservation of rare timber tree species. A few educated individuals directly involved in the nurseries were found to understand the need for rare species conservation. However, in that the nurseries are not owned by the wider community, an understanding of conservation is not held by the wider community. Nurseries growing two rare and valuable species may have had an impact on a few individuals, but not a measurable impact on the community as a whole. This poses a potential problem for the planting and care of the trees by the community. If the seedlings are given to households to plant in their forest, in many cases they may not be valued by the households, or the planting of trees considered important. The villages are often paid to plant trees also. Whether they will respect the gift of trees from this project and care adequately for them is not clear.

One approach to raise the awareness of the nurseries and these species, already utilised once in Nam Co Commune, is holding a planting festival. With the current lack of a market, this was the recommended action for the remaining seedlings in Nam Co Commune. The previous festival was very small and focussed only on *T. cryptomerioides*. About 10 families, commune officers, FPD officers and FFI staff members took part in the festival. Each household was given one to three trees to plant in their forest. For a future planting festival, each household could be given 100 *F. hodginsii* trees. There is a reasonable amount of labour involved in planting these trees, and if no payment is made for planting then it is not clear whether the festival will be successful. However, the initiative is worth trying, to determining the level of interest there is at a household level for forest improvement.

For the pilot project as a whole, the review team noted the difficulty of working with the FPD. It is clear that their role is narrow and effectively restricted to education. There was much evidence of illegal harvest and some trade of wildlife yet no indication of the FPD ability to control this. During the walk into and out of Phin Ngai and Lung Cung villages, the review team passed many local people carrying sawn *F. hodginsii* on their backs. This timber was being transported from Van Ban district for pick up in Tu Le local town, on the main road to Yen Bai, a fact confirmed by the wood carriers. Also, sawn *Fokienia* being transported by motorbike relatively late at night was observed. Out the front of the FDP main office

in Mu Cang Chai, one member of the team was offered a small forest animal (dui), and in Van Ban an offer was made of one type of monkey. A businessman noted that Hmong people from Na Nheo village occasionally bring forest wildlife down to the valley to sell.

Future Approaches to Community-Managed Nurseries

Although the nurseries have not been successful in terms of sustainable community livelihood improvement leading to improved conservation outcomes, there are many lessons to be learnt, and high potential for successful community nursery enterprises in the future. Remote nurseries can still have a competitive advantage due to reduced transport costs because they will locate nearby nurseries of NP and SFEs. The key requirements are:

- A dedicated funding program—through either government or a specific externally funded project—so there is a market for the seedlings.
- An intervention which builds on existing local skills by utilising local institutions with the necessary technical skills (district 5MHP staff, State Forest Enterprise, NP staff) will be better than an independent intervention. Hoang Lien Son National Park in Sa Pa, and the North-West Forestry Science Production Centre in Son La, a Research Station of the Forest Science Institute of Vietnam are two institutions having recent experience in *F. hodginsii* propagation. The experience of these centres should be utilised in future nursery development and may be particularly useful as contacts for staff from district 5MHP management boards if they are included in a project.
- An appropriate technical method of establishing and operating nurseries for the capacity of the village. There is comprehensive and detailed published information on *F. hodginsii* propagation; this should be reviewed and written in simple language that farmers can understand and apply.
- Establishment of clear contracts understood and agreed by the parties directly involved, with contracts regularly reviewed to reinforce the content and ensure the provisions are followed.

The role of FFI, or another organisation would be to:

- Facilitate a contract between the farmer and the NP and district 5MHP management board with an agreed seedling price and quality standard, and timeframe for delivery.
- Pay for labour and setup costs, in particular for collection or purchase of seed, site preparation, irrigation pipes, shade and fencing, but not to meet recurrent costs for labour for pricking out, potting and tending.
- Pay for technical advice and mentoring by district 5MHP staff or NP staff, perhaps for 1 week at setup and 1 day per month thereafter.

If a project occurs in the NP, then a slightly modified method could be adopted. As the NP has their own extensive facilities, and is already producing *Fokienia* seedlings, they could germinate the seed and provide germinates to the villages to

prick out and grow on. Germinates could be transported and pricked out in 1 day for two similar nurseries in Seo Mi Ty village. The germinates would be grown on to the larger 'ready to plant' size in the village where they will be planted.

Conclusion

The establishment of small community-managed nurseries for *F. hodginsii* and *T. cryptomerioides* is a pilot program which has not achieved its target objectives. The potential to achieve improved livelihood of the smallholders and conservation benefits of high value and rare timber species from these nurseries is not apparent. In particular problems exist with a lack of market for the seedlings, inadequate support and poor technical advice. Minimal conservation benefit has resulted from this project for *F. hodginsii*. The establishment of a small nursery and plantings of *T. cryptomerioides* is a positive outcome for this very rare species. Further work is required for these species if a secure conservation status is to be achieved.

The selection of households for the nurseries was generally adequate, although more focus could be placed on the involvement of women in managing the nurseries. The use of MOUs was not well managed. While a useful tool, in the pilot nurseries, the content was not understood or complied with, leading to confusion over ownership of the seedlings.

Small business enterprises for rare tree species in remote villages not involved in a cash economy are not sustainable. There is potential for successful nurseries; however, they will be dependent upon a specific funding program for these species. Future projects should use a different method of intervention and build on existing structures operating in the target communes, rather than working independently. The technical knowledge and experience in growing *F. hodginsii* is well understood and should be reviewed and fully utilised in a future project.

The review team noted the difficulties this project faced working in remote communities, with poor governance and project partners that do not have a high capacity for assistance. However, during the field trip and visits to these forests and communities, the need for improved conservation was apparent because illegal logging of these species was continuing and the area of natural forest was narrowing and only existed on very high mountain places. It is to be hoped that some of the lesson learnt from this pilot project can be applied in a successful program in the future.

More information on this project can be viewed at <http://www.hoanglienson.org.vn>.

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